

PRELIMINARY AMENDMENT

New U.S. Patent Application to Katsuhiko TAKAHASHI et al.

AMENDMENTS TO THE SPECIFICATION

Amend the specification by inserting before the first line the paragraph:

This is a National Stage entry of International Application PCT/JP03/04514, with an international filing date of April 9, 2003, which was published under PCT Article 21(2) in Japanese, and the disclosure of which is incorporated herein by reference. Further, International Application PCT/JP03/04514 is based on Japanese Patent Application No. 2002-108178, filed in Japan on April 10, 2002, the disclosure of which is incorporated herein by reference.

Please delete the title at page 1, line 1.

~~Description~~

Please replace the paragraph beginning at page 3, line 22, with the following, revised, paragraph.

As the binder, one or more of a polyvalent phenol compound, phenol resin, alkyd resin, polyester resin and epoxy resin can be used. This binder ~~preferably~~ may also exhibits a reducing action. In addition, a fine powder of a thermoplastic resin such as polystyrene or polyethylene terephthalate with an average particle diameter within a range from 20 nm to 5 μ m may also be used as the binder.

Please replace the paragraph beginning at page 4, line 7, with the following, revised, paragraph.

PRELIMINARY AMENDMENT

New U.S. Patent Application to Katsuhiko TAKAHASHI et al.

A method of forming a conductive coating of the present invention comprises the steps of applying the conductive composition, and performing heating, ~~preferably~~ may be at a temperature within a range from 140 to 200°C.

Please replace the paragraph beginning at page 4, line 10, with the following, revised, paragraph.

A conductive coating of the present invention is obtained by the above formation method, wherein the silver particles are fused together, and the volume resistivity is ~~preferably~~ may be no more than $3.0 \times 10^{-5} \Omega \cdot \text{cm}$.

Please replace the paragraph beginning at page 4, line 14, with the following, revised, paragraph.

~~As follows is a detailed description of the invention~~ follows.

Please replace the paragraph beginning at page 5, line 1, with the following, revised, paragraph.

The average particle diameter of this particulate silver compound is within a range from 0.01 to 10 μm , and can be selected appropriately in accordance with the conditions of the reduction reaction, for example, the heating temperature, the presence of a reducing agent, and the reducing power of the reducing agent. The use of a particulate silver compound with an average particle diameter of no more than 0.5 μm provides a particularly fast reduction reaction,

PRELIMINARY AMENDMENT

New U.S. Patent Application to Katsuhiko TAKAHASHI et al.

which is preferable. Furthermore, a particulate silver compound with an average particle diameter of no more than 0.5 μm can be produced by a liquid phase method in which a silver compound and another compound are reacted together, for example, a method in which silver nitrate and an alkali such as sodium hydroxide are reacted together to form silver oxide. In this case, a dispersion stabilizer ~~is preferably~~ may be added to the solution to prevent coagulation of the precipitated particulate silver compound.

Please replace the paragraph beginning at page 6, line 1, with the following, revised, paragraph.

Furthermore, the binder ~~is preferably~~ may be a resin or compound from the above group which either itself exhibits a reducing action, or has oxidation polymerization properties, so that during heating, it reduces the particulate silver compound while undergoing polymerization itself. By choosing such a binder, the quantity of reducing agent added can be reduced, or alternatively, the need for a reducing agent may be eliminated altogether. Examples of binders which have such a reducing effect are polyvalent phenol compounds, phenol resins and alkyd resins.

Please replace the paragraph beginning at page 6, line 17, with the following, revised, paragraph.

The quantity of binder used relative to 100 parts by weight of the particulate silver compound is typically within a range from 0.2 to 10 parts by weight, and ~~preferably~~ may be from

PRELIMINARY AMENDMENT

New U.S. Patent Application to Katsuhiko TAKAHASHI et al.

0.5 to 5 parts by weight. At quantities less than 0.2 parts by weight, there is no blending effect, whereas if the quantity exceeds 10 parts by weight, then the resistance of the obtained conductive coating increases.

Please replace the paragraph beginning at page 6, line 22, with the following, revised, paragraph.

The reducing agent used in the present invention reduces the particulate silver compound mentioned above, and ~~preferably~~ may generates a gas or a highly volatile liquid as the by-product of the reduction reaction, which does not remain within the produced conductive coating. Specific examples of reducing agents with such properties include one or more of ethylene glycol, diethylene glycol, triethylene glycol and ethylene glycol diacetate.

Please replace the paragraph beginning at page 7, line 3, with the following, revised, paragraph.

The quantity of reducing agent used relative to 1 mol of the particulate silver compound is typically no more than 20 mol, and ~~preferably~~ may be within a range from 0.5 to 10 mols, and may be from 1 to 5 mols. Taking the reaction efficiency and the volatilization caused by the heating process into consideration, quantities exceeding an equimolar quantity are preferred, but any reducing agent added in excess of a maximum 20 mols is wasted.

PRELIMINARY AMENDMENT

New U.S. Patent Application to Katsuhiko TAKAHASHI et al.

Please replace the paragraph beginning at page 7, line 24, with the following, revised, paragraph.

Furthermore, when added, the dispersion medium ~~preferably~~ may favorably disperses the particulate silver compound with an average particle diameter of no more than 1 μm , thus preventing secondary aggregation of the particulate silver compound. Examples of such a dispersion medium are hydroxypropyl cellulose, polyvinylpyrrolidone and polyvinyl alcohol, and the quantity used is typically within a range from 0 to 300 parts by weight relative to 100 parts by weight of the particulate silver compound.

Please replace the paragraph beginning at page 8, line 5, with the following, revised, paragraph.

In a first example of a conductive composition of the present invention, the particulate silver compound and the binder described above are dispersed in a dispersion medium. Furthermore, a dispersant may also be added according to need. The particulate silver compound used in this example ~~preferably~~ may have ~~has~~ a small average particle diameter of no more than 1 μm , as this allows the reduction reaction to proceed faster.

Please replace the paragraph beginning at page 8, line 10, with the following, revised, paragraph.

Furthermore, the viscosity of the conductive composition in this example varies depending on the film forming conditions, and in the case of screen printing for example, is

PRELIMINARY AMENDMENT

New U.S. Patent Application to Katsuhiko TAKAHASHI et al.

~~preferably~~ may be within a range from approximately 30 to approximately 300 dPa·sec.

Furthermore, the method of using the conductive composition of this example involves simply applying the conductive composition to the target using appropriate means, and then heating the resulting structure. The heating temperature is typically within a range from 180 to 200°C, and the heating time is from approximately 10 seconds to approximately 180 minutes.

Please replace the paragraph beginning at page 9, line 1, with the following, revised, paragraph.

Furthermore, the viscosity of the conductive composition of this example also varies depending on the film forming conditions, and in the case of screen printing for example, is ~~preferably~~ may be within a range from approximately 30 to approximately 300 dPa·sec.

Please replace the paragraph beginning at page 9, line 23, with the following, revised, paragraph.

Consequently, the value of the volume resistivity of a conductive coating of the present invention falls within a range from $3 \times 10^{-6} \Omega \cdot \text{cm}$ to $8 \times 10^{-6} \Omega \cdot \text{cm}$, which is approximately the same volume resistivity as metallic silver.

PRELIMINARY AMENDMENT

New U.S. Patent Application to Katsuhiko TAKAHASHI et al.

Please replace the paragraph beginning at page 10, line 19, with the following, revised, paragraph.

~~Specific examples are shown below, although the present invention is not limited to the examples presented below.~~ The following provides a description of specific examples. However, although the invention will be explained below in more detail by reference to the following Examples, the invention should not be construed as being limited to the following Examples only. It is to be expressly understood, that the Examples are for purpose of illustration only and are not intended as a definition of the limits of the invention.

Please insert after the paragraph beginning at page 22, line 12, the following paragraph.

Although the above exemplary embodiments of the present invention have been described, it will be understood by those skilled in the art that the present invention should not be limited to the described exemplary embodiments, but that various changes and modifications can be made within the spirit and scope of the present invention.

Please delete the title at the top of page 23, line 1, and insert the following line.

CLAIMS

WHAT IS CLAIMED IS:

PRELIMINARY AMENDMENT

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Please delete the present Abstract of the Disclosure and replace it with the following new Abstract of the Disclosure.

A conductive composition capable of producing a conductive coating with excellent flexibility and a high conductivity comparable to that of metallic silver, without using high temperatures as film forming conditions. The conductive composition includes a particulate silver compound and a binder, and optionally a reducing agent and a binder. Silver oxide, silver carbonate and silver acetate and the like are used as the particulate silver compound. Ethylene glycol, diethylene glycol, and ethylene glycol diacetate and the like are used as the reducing agent, and a fine powder of a thermosetting resin such as a polyvalent phenol compound, phenol resin, alkyd resin or polyester resin, or a thermoplastic resin such as a styrene resin or polyethylene terephthalate, with an average particle diameter from 20 nm to 5 μm is used as the binder. Furthermore, the average particle diameter of the particulate silver compound is ~~preferably~~ may be from 0.01 to 10 μm .